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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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Application No.: 10/088,153

} on May 21, 2004

Invention: STRIP CASTING



Applicant: Hisahiko Fukase

} (Signature)

Filed: March 13, 2002

} Arland T. Stein

Attorney

Docket: 29385-68561

} (Printed Name)

Examiner: Tran, Len

RESPONSE AND EXTENSION OF TIME

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Applicants respectfully submit the following response to the Official Action of
January 22, 2004.

Herewith is a check in the amount of \$410.00 for a two month extension of time.

Please charge any additional fees, or credit any overpayment in connection with this request,
to Applicant's undersigned counsel's deposit account 10-0435 with reference to matter no.

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Response to § 112 rejection: The continuous biasing is enabling a “setting” of the initial gap and also “accommodating” a wider gap of the strip desired thickness. The Examiner is correct that the wider gap is not set at the same time. Indeed the wider gap is never set in the present invention as explained below.

Double Patenting Rejection: Claims 1 to 23 have been rejected on obviousness type double patenting based on claims 1-4 of U.S. Patent No. 6,397,924 in view of JP 55-165290 and JP 59-215257. However, there is a basic misunderstanding of the ‘924 patent and JP ‘257 patent and how they differ from the presently claimed subject matter.

The ‘924 patent is directed to a modular construction in which the casting rolls are installed in a moveable module readily moveable in and out of the caster. It is true that in claim 1, a method is set forth where the “roll carriers [are] moveable on the modular frame to permit bodily movement of the rolls toward and away from one another to vary the nip between them.” Claim 1 also states that the “adjustable stop means [are] disposed on the modular frame beneath the nip and between the roll carriers to serve as a spacer stop for minimum engagement with the roll carriers to pre-set the minimum width of a nip between the rolls and adjustable in width to vary the minimum width of the nip.” The method of claim 1 also includes “the steps of adjusting the stop means on the module frame to pre-set the minimum width of the nip between the rolls, moving the roll module into a casting position in the strip caster, and connecting roll biasing means to the module to bias the rolls against the stops.” However, as the Office Action concedes, the “US ‘924 fail[s] to teach ... to increase the width of nip while casting.” Office Action at 3.

JP ‘260 is cited for disclosure of the negative crown spacing between 0.3mm to accommodate thermal expansion. But this feature is only involved in the presently claimed subject matter in dependent claims. The Office Action tacitly concedes that there is no disclosure or suggest in JP ‘260 of the combination of set forth in the independent claims of the present application.

This brings us to the disclosure of JP ‘257. JP ‘257, and how it distinguishes from the presently claimed subject matter, is best understood by comparing the respective methods: (i) before start up of casting, (ii) at the outset of the casting rolls, and (iii) after start of casting. *See Addendum A attached hereto.* The only similarity between JP ‘257 and the presently claimed subject matter is before start up, when an initial gap is set at less than the desired thickness of the strip to allow formation of the casting pool without dummy bar.

From that point forward the presently claimed subject matter and the JP ‘257 methods are quite different and in fact teach in contrary directions. In JP ‘257, the casting

rolls are maintained at a set position to produce strip at the thickness of the initial gap at the outset of casting. In JP '257, it is only after casting has started that the speed of the casting rolls are gradually changed as the gap between the casting rolls is gradually widened according to the formula $t = K \cdot V^{-0.5}$, where t is the thickness of the strip being cast, K is a constant depending on steel type, and V is the velocity or speed of rotation of the casting rolls.

By contrast, in the presently claimed subject matter the counter rotation of the rolls is at a speed of rotation to cast strip of thickness greater than the initial gap at the outset of casting by the first casting roll moving bodily away from the second casting roll against the continuous bias to increase the gap to accommodate the desired thickness of the strip to be cast. Thereafter the continuous casting the strip continues at the desired thickness, which is determined by the biasing force and the roll speed.

To better understand the differences, the attached chart at Addendum A has been prepared comparing the disclosures and the differences between the claimed invention and JP '257.

The Office Action is wide of the mark with the statement:

"JP '257 discloses the method of strip casting by setting an initial gap between the rolls at the nip which is less than the thickness of the strip to be cast, and then increasing the gap between the rolls to accommodate the thickness of initially cast strip for the purpose of permitting an easy start up"

Office Action at 3-4. In JP '257 the initial gap is not changed until after casting has begun and, by gradually changing the gap and the speed in the coordinated manner according to the formula $t = K \cdot V^{-0.5}$. None of this is involved in the presently claimed subject matter.

Rather, the presently claimed subject matter discloses a much improved method of start up without dummy bar where at the outset of casting the speed of rotation corresponds to a gap greater than the initial gap by the first casting roll moving bodily away from the second casting roll against a continuous bias to increase the gap to accommodate the desired thickness strip to be cast from the beginning. There is no gradual coordinated change in the gap and the rotation speed during casting in the presently claimed subject matter.

Section 103 Rejections: Claims 1, 5-23 are rejected under 35 U.S.C. § 103(a) as being unpatentable over EP 903 190 further in view of JP '257; and claims 2-4 rejected under 35 U.S.C. § 103(a) as being unpatentable over EP '190 in view of JP '257 and further in view of JP '260.

EP ‘190 discloses apparatus for making cast strip with a twin roll caster. The casting rolls are mounted in a cassette providing for quick change of the casting rolls as a preassembled module. There is adjustable stop means disposed beneath the nip between the rolls and between the roll carriers to serve as a spacer stop for engagement of the roll carriers to preset the minimum width of the nip between the rolls and adjustable in width to vary the minimum width of the nip. Roll biasing units act on pairs of roll carriers to bias both rolls inwardly against the limit established by the stop means set the initial width of the nip for casting strip. There is no disclosure or suggestion as to how one would combine the apparatus of EP ‘190 with JP ‘257. Such a combination would require considerable modification of both structures, which can not be properly done to support a Section 103 rejection. *See*, MPEP § 2143.01. More importantly, even if you could combine the apparatus of EP ‘190 with the method of JP ‘257 would not result in the present invention for the reasons detailed above with regard to JP ‘257 and Addendum A attached hereto.

As to claims 2-4 they are dependent claims depending from claim 1. Since EP ‘190 and JP ‘257 are deficient for all the reasons described above in relation to the subject matter of claim 1, the rejection of claim 2-4 fails.

Response to Arguments: The Examiner’s comments with regard to the applicant’s previous arguments is particularly appreciated since it explains the misunderstanding. The Examiner’s quote from the applicant’s argument on page 7 is taken at the time frame of the outset of casting, and is quite correct. The particular features of the presently claimed subject matter which are not disclosed or suggested by JP ‘257 can be pointed out in claim 1: the presently claim 1 requires the step of “casting a strip from the molten metal in the casting pool delivered downwardly from the nip without a dummy bar **at outset of casting to a thickness greater than the initial gap setting between the first and second casting rolls** by the first casting roll moving laterally away from the second casting roll against the continuous biasing to increase the gap between the casting rolls to accommodate the desired thickness of the cast strip to be cast.” JP ‘257 teaches precisely the opposite. JP ‘257 teaches that the outset of casting the initial gap set before casting is maintained, and the initial strip cast at the outset of casting is at a thickness determined by the initial gap. Only thereafter casting starts, by gradually changing the speed of rotation and strip thickness in a coordinated manner according to the formula $t = K \cdot V^{-0.5}$, is the method of JP ‘257 enable to reach casting strip at the desired thickness. Clearly this is not “on the outset of casting” as in the presently claimed method.

In some, applicant respectfully submits that the presently claims 1-23 are distinguish quite clearly from the cited prior art, and are in condition for allowance. Applicant respectfully requests that the claims be allowed in the application by passed to issue.

Respectfully,

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Time Period	Claimed Invention	JP '257	Comment
Before Start Up	Initial gap set at less than desired thickness of the strip to allow formation of the casting pool without dummy bar.	Initial gap set at less than desired thickness of the strip to allow formation of the casting pool without dummy bar.	Same
At Start Outset of Casting	Counter rotating rolls at a speed of rotation to produce strip of thickness greater than the initial gap ... with first casting roll moving bodily away from second casting roll against the continuous biasing to increase the gap to accommodate the desired thickness of the strip to be cast.	Counter rotating rolls at a speed of rotation set to produce strip at the thickness of the initial gap ... with the first casting roll remains in position relative to the second casting roll to produce strip of the thickness of the initial gap.	Different: Speed of rotation in '257 determined by initial gap setting to produce strip at the thickness of the initial gap. By contrast in claimed invention, speed of rotation to produce strip greater than initial gap and rolls moving away from each other against a bias determined to produce strip at the desired thickness.
After Start of Casting	Casting of strip continued at the said desired thickness , with the gap determined by the biasing force and the roll speed.	Gradually decreasing the speed of counter rotation the casting rolls increase as the gap is gradually widened according to the formula $t = K \cdot V^{-0.5}$, where t is the thickness for the strip being cast, K is a constant depending on steel type, and V is the velocity or speed of rotation of the casting rolls.	Different: In '257, desired strip thickness not achieved for some period after the outset of casting as the casting roll speed and the gap width are gradually increased in a coordinate manner according to the formula $t = K \cdot V^{-0.5}$. By contrast in the claimed invention, gap controlled immediately to desired strip thickness by speed of rotation and biasing forces.